The *Brenell*

HI-FI TAPE LINK



SPECIFICATION

RECORDING AMPLIFIERS

STEREO SENSITIVITY — 75 millivolts
MONO SENSITIVITY — 100 millivolts
(Mixing facilities on Mono)
IMPEDANCE — 1 Megohm
INPUT SOCKETS — 2 Phono at rear of chassis. 2 Jack on front panel
OUTPUT SOCKET — 13 pin type to accept deck plug
MODULATION LEVEL INDICATORS — 2 P.P.M. meters
GAIN CONTROLS — Dual Concentric
TRACK SELECTOR SWITCH — Stereo — Upper — Lower
FREQUENCY COMPENSATION — 15, 7½, 3¾, 1⅞ New C C I R
VALVES — E C C 81 (2). E C C 83 (2) E C C 82 (1)
BIAS OSCILLATOR — Push Pull 90 Kc/s

PLAYBACK PRE-AMPLIFIERS

OUTPUT LEVEL — Continuously variable up to 1 volt into 47 Kohms
OUTPUT SOCKETS — 2 Phono at rear of Chassis. 2 Jack on front panel
INPUT SOCKETS — 2 Phono at rear
INPUT SENSITIVITY — 1·5 mV for 1 Volt output
FREQUENCY COMPENSATION — 15, 7½, 3¾, 1⅞ New C.C.I.R.
GAIN CONTROLS — Dual concentric
VALVES — E C C 83 (2), E C C 81 (1)

RECORD/PLAYBACK

FREQUENCY RESPONSE WHEN USED WITH HEADS SPECIFIED:—
15 i.p.s., 40 c/s to over 15Kc/s ± 2dB
7½ i.p.s., 40 c/s to 14Kc/s ± 3dB
3¾ i.p.s., 40 c/s to 11Kc/s ± 3dB
1⅞ i.p.s., 40 c/s to 6Kc/s ± 3dB
SIGNAL TO NOISE RATIO — 50 dB for ½ TRACK. 45 dB for ¼ TRACK

TAPE LINK DIMENSIONS:—

FRONT PANEL — 15½" × 4½"
CASE — 13¾" × 4" × 8¾"
MOUNTING — Any position

SEPARATE POWER UNIT

INPUT VOLTAGES — 100—125v, 200—250v
H.T. RECTIFIER — EZ80
L.T. RECTIFIER — M201

POWER UNIT

DIMENSIONS — 4" × 6¼" Chassis, 4" high
MOUNTING — Any position
NETT WEIGHT — (Including Power Unit) 18 lbs

THE BRENELL HI-FI TAPE LINK IS DESIGNED TO OPERATE WITH DECKS HAVING THREE HEADS OF THE FOLLOWING TYPES:—

	ERASE	*RECORD*	*PLAYBACK*
2/2 TRACK (half track)	~~BL240~~ or UL290	UK202	UK200
2/4 TRACK (quarter track)	BL218 or UL296	UK207	UK205

PRICE £46.0.0
(including Power Unit)

Mk. 5 SERIES 3 DECK fitted 3 Stereo Heads for use with Tape Link: £54

Brenell ENGINEERING CO. LTD.,
231-235 Liverpool Road, London, N.1 Tel. NORth 8271 (5 lines)

The *Brenell* HI-FI TAPE LINK

As most owners of High Fidelity sound reproducing equipment will know, tape recordings cannot be made from the amplifiers and pre-amplifiers by simply connecting a tape deck to the sockets marked 'Record', a vital 'Link' between tape deck and amplifying equipment is required, i.e., specially designed recording amplifiers incorporating high frequency Erase/Bias oscillators matched for use with the heads on the tape deck.

Similarly for playback purposes, if the very best reproduction at all tape speeds is to be accomplished, specially designed playback pre-amplifiers must be incorporated between the tape deck and the pre-amplifiers of the High Fidelity equipment.

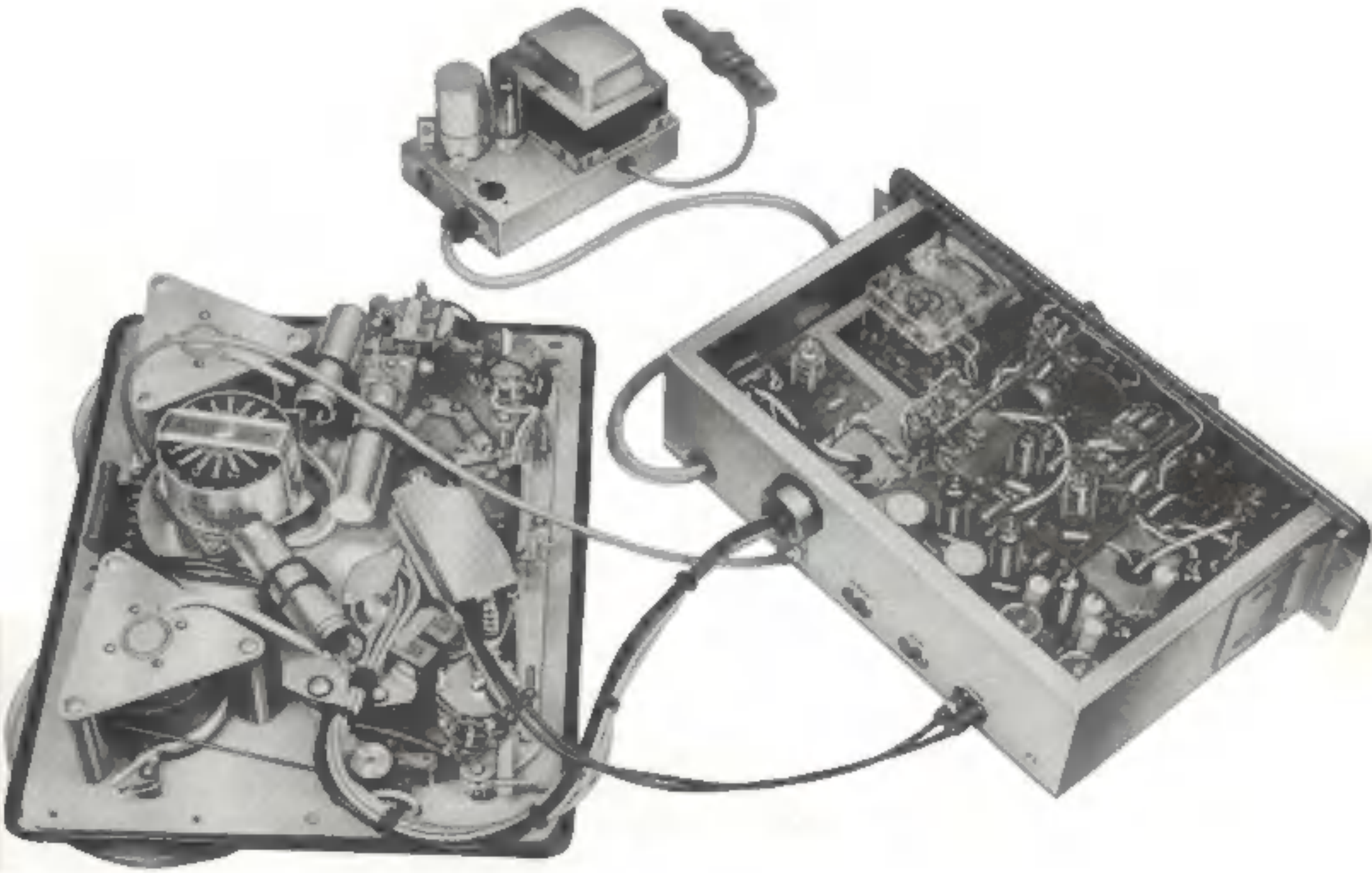
The Brenell Hi-Fi Tape Link contains twin recording amplifiers, 'Push Pull' Bias/Erase oscillator, twin playback preamplifiers and is designed for use with a three headed stereophonic tape deck, i.e., separate Erase, Recording and Playback heads of either the half track or quarter track types (List of recommended heads included in the specification notes) and any make of High Fidelity amplifying equipment capable of supplying a signal level from Radio Tuners, Microphones, Gramophone Pick-ups, etc., of at least 75 millivolts (the output from a Hi-Fi pre-amp usually ranges from 125 to 500 millivolts).

Mono and Stereo recording facilities are provided and whilst recording is in progress one may listen to the recorded material a fraction of a second after recording has taken place or to the signal being fed to the recording amplifier. (Comparison of the recorded and original signals may be undertaken). Two edgewise scaled illuminated meters indicate the recording signal level and dual concentric gain controls give individual control of the two recording amplifiers. Variable Bias enables the recordist to obtain optimum results at all tape speeds with all brands of tape. Frequency correction for four tape speeds, both for recording and replaying, is incorporated.

To ensure elimination of hum, the amplifiers are completely enclosed in a strong metal case, valves are D.C. heated and the power unit is on a separate chassis in order that it may be mounted where it cannot introduce hum into the system.

Sockets at the rear of the Link enable it to be connected to the tape deck and high fidelity equipment without the need to expose the coupling cables but on the front panel are sockets which enable additional equipment to be connected for recording and replaying purposes, e.g., should a recording be made from some other tape recorder, this recorder's output would be connected to the front panel input sockets whilst the output sockets on the front panel would be used if a copy of a tape were to be made on the other recorder. The rear sockets are disconnected whenever the front panel sockets are used.

The Brenell Hi-Fi Tape Link (Top Cover removed) amplifier unit and power unit shown connected to a Brenell 3-headed Stereo Tape Deck. Note simplicity of coupling by means of plugs and sockets.



TECHNICAL REPORTS

Brenell Hi-Fi Tape Link. Price £46 including power unit. Manufactured by Brenell Engineering Co. Ltd., 231-235 Liverpool Road, London, N.1.

Makers' Specification:

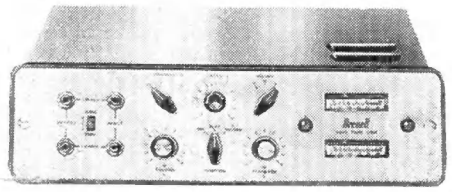
RECORDING AMPLIFIERS. *Sensitivity:* 75 mV stereo, 100 mV mono (mixing facilities on mono). *Impedance:* 1 Megohm. *Level indicators:* two PPM type meters. *Frequency compensation:* 15, 7½, 3¾, 1⅞ ips New CCIR. *Valves:* ECC81 (2), ECC83 (2), ECC82 (1). *Oscillator:* push-pull 90 Kc/s.

PLAYBACK AMPLIFIERS. *Sensitivity:* 1.5 mV for 1 Volt output. *Output:* continuously variable up to 1 Volt into 47 K. *Frequency compensation:* 15, 7½, 3¾, 1⅞ New CCIR. *Valves:* ECC83 (2), ECC81 (1).

Record/Playback response: when used with heads specified, 15 ips 40-15,000 c/s ±2 dB; 7½ ips 40-14,000 c/s ±3dB; 3¾ ips 40-11,000 ±3 dB; 1⅞ ips 40-6,000 ±3 dB. *Signal-to-noise ratio:* 50 dB for ¼ track, 45 dB for ½ track. *Dimensions:* front panel 15½ × 4½ in., case 13¾ × 4 × 8¾ in. *Power supply:* 100-125 V, 200-250 V AC, separate unit measuring 6½ × 4 × 4 in. *Net weight:* both units 18 lb.

The Brenell Hi-Fi Tape Link is truly a *link* and it is important to understand the other equipment with which it must be used to form a complete recording and reproducing chain.

The first requirement is a stereo tape deck, that is the transport mechanism with three separate magnetic heads for tape erasure,



recording and playback. The second requirement is a high fidelity stereo amplifier of the type which can supply a low level signal of at least 75 millivolts (from any of its sources—gram, radio, microphone, etc.) and which also has 'tape monitoring' facilities. Finally, it is assumed that the high fidelity amplifier is connected to suitable loudspeakers.

Given this chain of equipment, the Brenell unit will provide very flexible stereo/mono record/playback facilities. It incorporates twin record amplifiers with independent gain controls and edge-wise volume meters in the two channels. There is a push-pull bias/erase oscillator, with a variable bias control, and twin playback pre-amplifiers. Switched equalization, on both record and playback, is provided for the four speeds 15, 7½, 3¾ and 1⅞ inches per second. The power supply unit for the amplifier is included in the price but is on a separate chassis so that it can be installed in a position which will eliminate hum pickup.

Being a link in a rather complicated chain, the Brenell unit appears at first to have a bewildering array of connectors. But these have been well thought out and did not present any difficulty. There are 3 pairs of phono sockets at the rear, to take the left- and right-channel inputs from the hi-fi pre-amplifier, outputs to the pre-amplifier and inputs from the deck playback heads. The first two pairs are duplicated by standard jack sockets on the front panel. These allow the rear connections to remain as part of a semi-permanent installation but make it easy to plug in additional equipment—such as a second tape recorder—for tape copying, etc. Inserting a jack plug in these front panel sockets automatically breaks the circuit to the corresponding rear socket.

All other connections to the tape deck are made via a 13-pin socket (plug supplied already wired to suitable cables) and include the leads to the record and erase heads, and to the record/playback function switch on the deck.

Operation of the Hi-Fi Tape Link may best be described by reference to the front panel controls reading from left to right. First we have the input and output jack sockets for upper and lower tracks and a slide switch labelled "Original" and "Tape". This is the monitor switch and it connects to the output of the Tape Link *either* the signal being fed in for recording purposes *or* the signal being reproduced from the tape. Thus, while recording is in progress, the recording quality can be instantly compared with the original. For this comparison to be immediately available through the associated hi-fi equipment it is necessary for the amplifier to be one which possesses 'tape monitor' facilities Then, although one is recording the gram, radio, etc. signal from the pre-amplifier, the power amplifiers and loudspeakers are actually monitoring the signal from the Tape Link: and this will be the recording or the record*ed* signal according to the position of the monitor switch just described. (Modern amplifiers will often have these tape monitoring facilities—for example, my home trials were successful on the Rogers Cadet III and Armstrong 221 Stereo systems, with Quad 22 and Leak Point One Stereo amplifiers also used as standards of comparison—though not possessing 'tape monitor' controls.)

Next on the front panel is the Compensation Switch, which introduces equalization (to the new CCIR recommendations) for the 4 speeds. Then comes the Bias control, which allows the user to adjust the bias voltage for optimum high frequency response from the given brand of tape, and a Record Stereo/Upper/Lower switch to introduce either or both tracks on the erase and record heads.

Below these three controls are the dual concentric volume controls for record and playback of the upper and lower track signals, and the Off/Play/Record function switch. (The bias/erase oscillator is operative only when this switch and that on the deck are both set to Record.) Finally, there are the upper and lower track level meters. These are of the right-hand mechanical zero type, in which the spring loading assists the quick reading of signal peaks, and have zero adjust controls.

The unit is housed in a strong metal case to keep out mains hum and DC heating is used to all valves. The wiring and the entire assembly has been solidly carried out and the whole unit has clearly been designed to give long, reliable service. Each playback amplifier consists of the two halves of an ECC 83 double-triode, with the switched equalization in a feedback loop from the second anode to the first cathode, and one half of an ECC 81. The record amplifier is another ECC 81 with a similar feedback form of equalization to give different degrees of treble boost. A further ECC 83 forms the meter amplifier/rectifier and an ECC 82 is employed as push-pull oscillator. The power unit has a conventional EZ 80 fullwave rectifier with resistance/capacity smoothing for HT and a separate bridge metal rectifier to produce DC heating to all valves.

The installation and operating instructions supplied are brief but easy to follow. The reviewer's task was made even easier by the fact that a Brenell Mark 5 Series III stereo tape deck was also made available, for which the Tape Link is, of course, primarily designed.

Performance Tests

As a preliminary to objective testing, the Brenell deck and Tape Link were used to replay a number of tapes of known excellence and an immediate impression of clean, wide response was obtained—reflecting credit on deck and Link unit together. Experimental recordings from radio, disc and tapes from a professional machine were then made so that the complete system was brought into play. Lining up of the controls was straightforward, that is the setting of bias (the maximum position of the

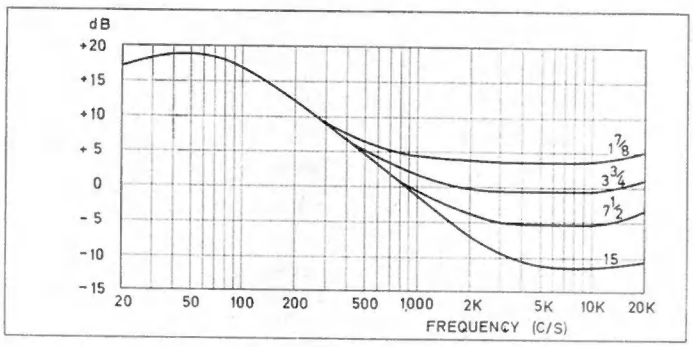


Fig 1. Brenell Hi-Fi Tape Link. Playback amplifier response.

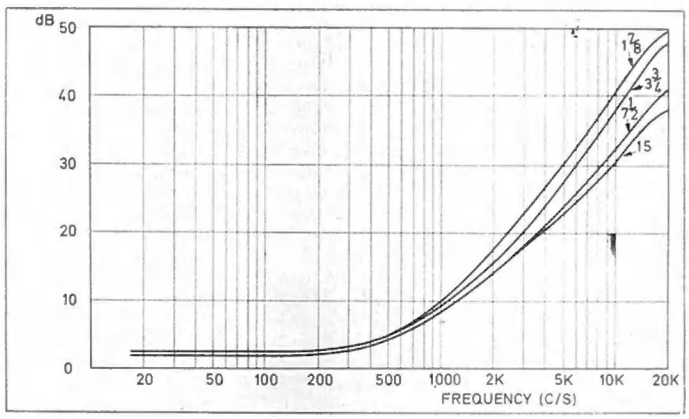


Fig 2. Brenell Hi-Fi Tape Link. Record amplifier response.

control seemed best for most tapes at the higher speeds with a slightly lower setting in a few cases), the adjustment of recording level and the playback volume for comparative checking. The level meters have a slow fall-back characteristic which simplifies the monitoring of programme volume. It was virtually impossible to distinguish between the ingoing and off-tape signals when recording at 15 or $7\frac{1}{2}$ ips: even at $3\frac{3}{4}$ ips, when bias was set for optimum fidelity on the reproduced signals, the difference was slight and confined to a small dulling of the extreme treble response.

Extensive measurements were made and those for the upper track are summarized in the diagrams. The performance of the lower channel was almost identical. Fig. 1 shows the response of the playback amplifier (upper track) at all 4 speeds, obtained by feeding a Bruel and Kjaer oscillator to the head input socket and pen-recording the 'tape' signal output. The components used correspond to the new DIN/CCIR recommended time constants (35, 70, 140 microseconds for the three standard speeds—and 280 μS for $1\frac{7}{8}$ ips) and the measured responses are in very close agreement. In a similar fashion, Fig. 2 shows the record amplifier response. The record/playback performance was also checked using EMI 99 tape and found to be comfortably within specification.

Record and playback sensitivity were also up to specification, channel separation was of the order of 38 dB and signal-to-noise ratio (recording 1 Kc/s at zero level and then erasing) was 46-48 dB on the lower track and 39-42 dB on the upper track—the higher speeds giving the better performance. For bulk erased tape, the noise level was at −49 dB relative to zero level. Bearing in mind the spread-eagled layout during testing, lower noise levels could no doubt be achieved in a properly installed system. Distortion in the playback amplifier was just over 0.1% and that for record/playback with 75 mV input and all gain controls at maximum was under 1%.

These are very good results, borne out by numerous operational and listening tests. Provided it is matched to equipment of comparable quality and specification, and with a first choice being the Brenell Mk 5 Series 3 deck, price £54, this new Tape Link from Brenell can therefore be strongly recommended as an example of British manufacture at its best.

JOHN BORWICK.